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Astrobiology missions

Mars Analog Rio Tinto Experiment (Marte): 2003 Drilling Campaign To Search For A Subsurface Biosphere At Rio Tinto Spain

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The Mars Astrobiology Research and Technology Experiment (MARTE) is a field experiment in the NASA ASTEP program designed to search for a subsurface biosphere in the region of the Tinto River in southwestern Spain while simulating a mission to search for subsurface life on Mars. MARTE has a dual focus on science and technology development: achieving new scientific results and demonstrating the technology for searching for a subsurface biosphere on Mars. The Tinto river is located in the Iberian Pyrite belt, one of the largest deposits of sulfide minerals in the world. The highly acidic (pH=2) river is colored red by the high concentration of ferric iron it carries. The extreme chemistry of the environment is produced by a microbial ecosystem that metabolizes sulfide minerals and produces sulfuric acid as a byproduct. Microorganisms found in the river live on chemical energy derived from sulfide and ferric iron minerals found in the region. We hypothesize that similar organisms could thrive in the underground aquifer that underlies the region. The system is of great interest for Astrobiology as an example of life sustained by inorganic compounds operating underground without oxygen and is an important analog to subsurface life on Mars. The first drilling campaign in the MARTE project took place in September 2003 and was focused on characterizing the microbiology of the subsurface at Rio Tinto using conventional drilling, sample handling and laboratory analysis techniques. This paper will describe results from the 2003 drilling campaign. Lessons learned from our drilling campaign are being used to guide the development of robotic systems and instruments needed for searching for life underground on Mars.

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